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ABSTRACT

This article discusses the issues that confront network users and systems operators when they explore and adapt their professional communications activities to electronic communication. (Electronic networking here refers to the use of the telephone and the computer to facilitate communication between or among professional groups in a variety of locations.) Networking is categorized into several functioning levels or types: level one--single user(s) and "host" system; level two--multiuser or local area network system; and level three--multinetwork system. Each level is defined in terms of equipment and personnel needed, and limitations of each system are noted. This article is specifically concerned with guidelines for level one, although some questions and guidelines are given for the other levels. Six major areas of concern relative to electronic networks and their selection are listed and discussed in terms of level one users: (1) define systems usage; (2) define where technical support and service will come from; (3) define how much funding is available and/or how much can be justified; (4) describe how "user-friendly" and adaptable the system must be; (5) determine the technical, physical scope of the network; and (6) determine the kinds of software capabilities that will be needed. Four priorities are listed for software needs: a communications package for hardware, a "starter kit" for some online network database, a software protocol and communications package for establishing one's own local network system, and specialized software to expand the local network. (JB)

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Guidelines For Selection of Electronic Networking Software and Hardware

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Guidelines For Selection of Electronic Networking Software & Hardware

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A number of writers have recently begun to discuss the potential for electronic networking as an avenue of improved professional communication. These sources have identified and discussed the advantages for using electronic memorandums and meetings, group conferencing via audio and/or video link-ups, and the electronic authoring of publications and sharing of bibliographic resources. These communication processes, obviously, are not new to the professional but have been expanded and enhanced by the electronic age, primarily by the video and computer media.

Electronic networking is only one of several types of communication systems that can be utilized between two or more persons and connecting one or more telecommunications mediums. For the purposes of this article, electronic networking refers to the use of the telephone and the computer to facilitate communication between or among professional groups in a variety of locations. In networking one individual establishes and maintains his or her computer as the "host" computer and other individuals in the networking group communicate with each other through their computer and its interconnect with the host computer. This person with the "host" computer is generally referred to as the systems operator and the other individuals in the network as communication users.

Some examples or applications of the usage of electronic networks by professionals and their associations are:

- Members of a professional association committee are able to conduct an ongoing committee meeting through the use of an electronic mail or conferencing communication network.
- Several professionals can collaborate on the preparation of a document (newsletter article, journal publication, association agenda item, etc.) through an electronic network system.

- An individual or group can seek bibliographic reference assistance o: general information input to a research project through the announcement of their needs on an electronic bulletin board or "mail drop" on a network.

- Professionals can expand and speed up their daily communication linkages and requirements through electronic network usage. This is especially useful to those frequently traveling and away from their office and institution environment.

Today professional associations or groups have a great potential to expand their communications activities through the usage of this telephone and computer networking. This article explains the issues that confront network users and system operators when they explore and adapt their professional communications activities to electronic communication. However, before any guidelines can be enumerated and reviewed, it is important to establish at which level of electronic network sophistication you will be operating. Networking can be categorized into several functioning levels or types. One listing of these categories is as follows:

- Level One: Single user(s) and "host" system.

  This level generally involves one user at a time communicating with a "host" computer via a telephone connection. The "host" computer may be a commercial on-line service or another professional user with the appropriate system operator software. The computers may be a mainframe, a small office computer or a micro system.

- Level Two: Multiuser or Local Area Network System.

  This level involves several users communicating within a computer driven network of user stations and related peripheral hardware. These systems are usually referred to as local area networks (LAN) and the user stations are wired directly to each other by one of several transmission media (twisted - pair wire, coaxial cable, fiber optics or microwave). These systems have size and distance limits.

- Level Three: Multinetwork System.

  This level includes multiple users and systems of either the levels one and/or two types which have been interconnected. The interconnection may be accomplished through large mainframe computers or specialized connecting links called gateways. This system level requires elaborate configurations and can provide unique and specialized functions.

In this article the discussion is concerned with the guidelines associated with level one. Some questions and guidelines are, however, outlined for the other levels. This is done in order to understand more clearly the thinking and decisions required by individuals and professional groups investigating the enhancement of their communication processes.

There are six major areas of discussion relative to electronic networks and their selection. Each is listed, questioned, and discussed in the context of the needs of level one professional users.

1. Define as specifically as possible the usage you and your association wish to make of the electronic communication network.

   You may want:

   - to be able to share peripherals (printer, disc storage, etc.)
   - to be able to share resources (common data through files and programs)
   - to be able to connect to on-line services
   - to have electronic mail capabilities
   - to have bulletin board capabilities
   - to do computer conferencing
   - to do data base development
   - to do word processing and/or typesetting

For educational professionals wanting to utilize electronic communication networking for professional association activities, the needs selected usually will dictate the selection of personal computer networks rather than multiuser systems (level two or three). This means the hardware/software decisions can be diverse and not as easy to accomplish as when purchasing a single vendor's "turn-key" system.

A careful analysis of your specific professional needs is critical to your effective selection of an electronic network. Because of technological

limits and cost considerations, you cannot easily develop an electronic network that will provide all the potential uses and still maintain the maximum speed, capacity, and adaptability of the hardware and software. It is helpful to rank order your potential uses and estimate the percentage of time you plan to commit to each type of need. This will provide guidance to you and your technical personnel or to the vendors you select in making the necessary subsequent decisions about your network. These judgments are required when selecting an appropriate network structure and its hardware when purchasing an electronic communications network. As a professional user, you should prioritize your needs in order to make judicial determinations to the questions regarding hardware scope and selection which are discussed in criteria #5 and #6 described below.

An important component of this usage assessment process is to develop a basic understanding of networking terminology. You will find it helpful to "speak the language" of the network technologies. Such terminology understanding, at an introductory level, is key to your ability to analyze and select the appropriate usage level and its corresponding network hardware and software requirements. There are three important communication network technologies: broadband, baseband, and PBX. Other terms like CSMA/CD, token passing, ring, and bus are terminology and structures imposed on the basic technologies. A number of introductory references and vendor literature items are available to assist you in this base terminology understanding. Several of the references to this article contain basic terminology lists that can be used to develop this understanding component. A reference, in particular, that is very definitive is from Digital Equipment Corp. (Digital, 1982).

2. Determine where your technical support and service will come from.

- from in-house experts.
- from commercial vendors.
- from contracted service agencies.
- other sources.

Individuals using communication networks often must rely upon their own skills in adapting and using software or in seeking any needed repair services. As a professional educator, you should consider this important factor when selecting your networking equipment and software. There may be technical

experts in your institution or vendors in your particular geographic region who can make the selection of a particular brand of equipment or software products more acceptable when related to these technical assistance needs. The availability of rapid equipment maintenance or assistance in modifying software programming is a key factor in the success of and appropriate outcome from your network application. In-house assistance or local vendors with critical expertise can be invaluable to the beginning network user.

3. Define how much funding is available and/or can be justified for your electronic communication needs Several categories of costs will be incurred in networking dependent upon your usage and sophistication level. You should define your funding requirements for:

   - hardware requirements
   - software procurement
   - monthly on-line charges (data base subscription)
   - maintenance (service contracts or repairs)
   - user instruction or training; support and information
   - future expansion

For the individuals interested in networking as part of their professional group's activities, these costs will typically be less than for those corporate or large multiuser systems. Typical entry-level or basic costs or an individual might be:

- hardware
  - microcomputer ($1000 to $3000)
  - modem ($200 to $400)
  - mainframe computer or node ($0 to $2000)
- networking software ($250 to $750)
- software on-line charges ($35 to $100 per month)
- maintenance ($0 to $150 per year)

4. Describe how "user-friendly" and adaptable the system, both hardware and software, must be.

   - How "transparent" is the access to files from the user station? Does a user need to go through involved entry commands or procedures to utilize the network in its various functions or levels?

- What can the system do, not what is it compatible with?

- Are commands common from user station to user station, both for individual software and other services? Do they seem easy and natural to the user?

- Are the commands such that they use common English language terms or their abbreviations? Are the commands easy to use and appropriate for the type of usage your network will have?

- Is security of communications important to your group? Both the level of physical security of your network stations and operational control over "eavesdropper" access should be determined.

The ease of operation considerations is important to the educational network user from both the hardware and software standpoints. The hardware should be selected for its easy assembly and integration into whatever existing system or on-line service you are accessing. However, it is the "friendly" nature and ease of operation of the software packages used on or by your network that is most important.

If you are a system operator rather than a network user, you need to review any and all software packages to determine how easy they are to understand, how common and interchangeable, how menu driven, and what amount of operational frustration are inherent with each package available for your potential hardware selection. Don't select hardware and then find that you can only utilize "unfriendly" software. Don't purchase an easy to use software item only to find it operates exclusively on a limited or inadequate hardware system. The two areas should be reviewed, evaluated and selected as a unit.

5. Determine the technical, physical scope of the network.

The key to this guideline area is first to specify clearly the level--one, two or three--in which you intend to function. Then you ask the appropriate technical questions as follows:

- How many potential users (maximum) will be in the system?

- Where will these potential users be located (physical distance from each other)?

- What will be the maximum amount of electronic traffic when mapping out the expected data traffic between user stations?

- What topology (wiring configuration) will be used?

- Will you be utilizing existing equipment and/or developing a hardware system from scratch?

- What peripherals (disk drives, printers,etc.) will be required at each user station? Or, what sharing of peripherals can be utilized?

- Can your system be developed in clusters and expanded as required?

- Does your system need flexibility and expansion capabilities? How much and what types?

- Do you need to link or provide some type of bridge to a mainframe computer environment?

- Is it important that the system adhere to recognized standards such as The International Standards Organization (ISO) and the Institute of Electrical and Electronics Engineers (IEEE)?

For the professional educators many of the above questions may initially be beyond their needs or technical understanding. Don't be overly concerned with this fact. Level one usage does not require many specific technical decisions in the planning stage. Read some of the basic literature, talk to other network users, visit someone's installation, and ask vendors for assistance. Through this process you will develop a basic vocabulary that will allow you to answer, in general terms, any of the above needed technical questions. Your commercial vendor or a technical consultant can then develop the specific specifications topology, wiring diagram, protocol interface, etc. for your system as it develops.

6. Determine what kinds of software capabilities you will need for the system.

- Can you match your identified use from #1 to available software?

- Are these software packages available in multiuser versions? (generally for level two/three)

- Can you rewrite or adapt any existing software for network usage?

These software needs will be directly related to the network level identified and to the usages outlined in guideline #1. For the individual user in an educational setting the software priorities will probably be as follows:

first - a communications package for your hardware

second - a "starter kit" for some on-line network data base

third - a software protocol and communication package for establishing your own local network system

finally - specialized software to expand your local network for selected needs such as: electronic mail, conferencing, word processing, educational programming, graphics development, etc.

Electronic networks may not be the solution for every professional educator's information problems. However, knowing exactly what you want to do ahead of time is the key to successful development and modification of your communication skills. It is the things you want to do that are important--not what they tell you can be done. The proposed guidelines will assist you in determining what electronic networking can or cannot do for improving your professional activities.

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